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ABSTRACT

This paper offers a reliability analysis of the teacher questionnaire used in the Teacher Education and Learning to Teach (TELT) Study conducted by the National Center for Research on Teacher Education (NCRTE). Data for the study were collected from 648 teachers and prospective teachers at 11 teacher education program sites throughout the United States. The questionnaire was designed to examine teachers and prospective teachers knowledge and beliefs about writing and mathematics; teaching, learning, and the teacher's role; learning and learners; and context schooling. Factor analysis and Linear Structural Relationship (LISREL) Analysis were used to get information about the reliability of individual items and the composite reliabilities for teacher knowledge and belief indices in the questionnaire. The reliability analysis was conducted on the basis of the dimension and categories of teacher knowledge and beliefs that the TELT study examines. The dimension and categories are summarized in a conceptual map in which items are grouped according to the category of knowledge or belief the investigators intended the item to assess. The knowledge and belief indices are summarized in data tables. (ND)

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Technical Series 95-1

ESTIMATING THE RELIABILITY OF THE TEACHER QUESTIONNAIRE USED IN THE TEACHER EDUCATION AND LEARNING TO TEACH (TELT) STUDY

Zongyi Deng

National Center for Research on Teacher Learning

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Abstract

This paper offers a reliability analysis of the teacher questionnaire used in the TELT Study conducted by the National Center for Research on Teacher Education (NCRTE). Factor analysis and LISREL are used for this analysis. This analysis provides information about the individual item and the composite reliabilities for teacher knowledge and belief indices in the questionnaire.

ESTIMATING THE RELIABILITY OF THE TEACHER QUESTIONNAIRE USED IN THE TEACHER EDUCATION AND LEARNING TO TEACH (TELT) STUDY

Zongyi Deng[1]

Introduction

The teacher questionnaire--developed by the National Center for Research on Teacher Education (NCRTE)[2]--has created strong interest among researchers and teacher educators throughout this country. This questionnaire was designed to examine teachers' and prospective teachers' knowledge and beliefs about writing and mathematics, about teaching, learning, and teachers' role, and learning and learners, and about context of schooling. It was used as one of the data collection instruments[3] in a multi-site, multi-year study of Teacher Education and Learning to Teach (TELT) conducted by the Center for the purpose of investigating how teachers and prospective teachers' knowledge, beliefs, and reasoning about teaching changed over time as they participated in a variety of teacher education programs (Kennedy, Ball, & McDiarmid, 1993).

The purpose of this article is to present a reliability assessment of this teacher questionnaire. In the assessment, reliability is estimated through factor analysis and LISREL--a methodology of reliability assessment which had been popular in social science (see Carmines & Zeller, 1979; Bagozzi, 1981; Smith, 1974; Long, 1986). By using factor analysis and LISREL in estimating reliability, the article is able to provide the information about both the reliabilities of individual items and the composite reliabilities for teacher knowledge and belief indexes in the questionnaire. The author hopes this information will

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[2]The NCRTE is housed at Michigan State University and sponsored by the United States Department of Education, Office of Educational Research and Improvement.

[3]Three data collection instruments--an interview, observation guide, and questionnaire--were used in the TELT study.

be of value to the researchers and teacher educators who are interested in using this questionnaire's items and indexes as a tool for additional inquiry.

Beliefs and Knowledge Measured on the Questionnaire

This reliability analysis is conducted on the basis of dimensions and categories of teacher knowledge and beliefs that the TELT study attempts to tap. The dimensions and categories are summarized in a "conceptual map" in which all items are grouped according to the category of knowledge or belief the investigators intended the item to assess (see Kennedy, Ball, & McDiarmid, 1993). Classification of items into these categories was done by the judgments of the investigators. This initial classification is the basis for the face validity of individual items as indicators for their category. This reliability analysis only focuses on the items with ordinal scales as well as the multiple-choice items with "right" or "wrong" answers (e.g., A47 to A50; B42 to B45).[4] The analysis does not include other multiple-choice items (e.g., A23 to A29; B18 to B22) because of the difficulty in doing reliability analysis for these items due to their value-latent feature.

The following are the dimensions and categories of teacher knowledge and beliefs in the above mentioned conceptual map, and the items selected for this analysis. The items are represented by their item numbers as they appear in the questionnaire, and are grouped conceptually according to the categories of teacher knowledge and beliefs. The dimensions, the categories, and the conceptual grouping of items constitute the theoretical framework for this analysis.

A. The Teaching and Learning of Writing

I. SUBJECT MATTER

1. Personal attitudes and behaviors (enjoyment; confidence; avoidance; behavior)
   A1, A3, A6, A7, A8, A9, A10, A11

2. Ideas about good writing (effective communication; mechanics & grammar; nice or correct product form; logical organization; audience/voice/purpose; creative; revised product; separate subject or integrated with others; connection with reading; neatness)
   A5, A12, A14, A16, A23, A30, A31, A32, A33, A34, A36, A37, A38, A66, A67, A68, A69, A73, A76, A77, A92, A98, A97, A99, A106, A109, A101,

[4]In doing the analysis, these multiple-choice items were recoded into dichomous items.

A111, A120, A121, A122, A123, A124, A125, A126, A127, A128, A129, A130, A131

3. Purposes for teaching writing (job skill; school skill; tool in life/communication; express thoughts & feelings; way of thinking; be literate)
A13, A14, A15, A17, A18, A19, A20, A21, A22, A23, A24, A26, A68, A74

4. Knowledge of writing (structure; composition, syntax; voice/audience; punctuation; writing process)
A72, A83, A84, A85, A86, A87, A88, A91, A112, A113, A114, A115, A116, A118

II. TEACHING AND LEARNING

5. Tasks (activities) (responding to students; evaluating students)
A66, A68, A70, A71, A89, A90, A95, A96, A100, A101, A102, A103, A104, A105, A106, A107, A112, A117, A118, A119, A132

6. Teachers' role (approach) (directive; facilitative; modeling)
A70, A71, A81, A89, A90, A91, A92, A93, A99, A101, A109, A110, A111, A116, A119

7. How learning occurs (development; constructing knowledge; additive)
A36, A40, A44, A45, A47, A48, A49, A50, A72, A75, A93, A99, A100

8. Social dimensions (interaction with others; individual)
A35, A46, A73, A78, A80

9. What to do to learn (repetition; drill; engagement in the craft of doing; memorization)
A45, A46, A99, A116

III. LEARNER

10. "Ability" (sources of failure; sources of success; native ability; effort; self-confidence; interest, anyone can achieve)
A31, A41, A42, A43

11. Diversity (social class; handicaps/gifted; gender; students having difficulty; age; visual learners)
A15, A39, A41, A43, A44, A47, A48, A49, A50, A77, A79, A94

IV. LEARNING TO TEACH

12. What teachers need to know (subject matter; skills of teaching, what other

teachers do; students; experience; patience; curriculum; how authors work)
A51, A52, A53, A54, A55, A56, A57, A58, A59, A60, A61, A62, A63, A64, A65, A82

13. How teachers learn
A55, A56, A57, A58, A59, A60, A61, A62, A63, A64, A65

B. The Teaching and Learning of Mathematics

I. SUBJECT MATTER

1. Personal attitudes (enjoyment; confidence; avoidance)
B2, B3, B4, B5

2. Ideas about mathematics (rules/procedures; body of knowledge; way of thinking; linear/step by step; arbitrary/abstract; creative)
B6, B7, B8, B9, B14, B15, B23, B24, B25, B26, B31, B35, B38, B65, B68, B69, B93, B94, B97

3. Knowledge of mathematics (proportion/ratio/ division; rectangle; place value; negative numbers, slope; equation; fractions)
B77, B78, B79, B80, B81, B82, B84, B92, B98, B99, B100, B101, B102, B103, B104, B105, B106, B107, B108, B109, B110, B111

4. Purposes for teaching mathematics (think better; school skill; tool in life/jobs & careers; be educated)
B10, B11, B12, B13, B16

II. TEACHING AND LEARNING

5. Tasks (activities (explaining/showing how/modeling; responding to students; evaluating students)
B65, B68, B70, B73, B94, B95, B96, B97, B98, B99, B100, B101, B102, B103, B104, B105, B106, B107, B108, B109, B110, B111, B132

6. Teachers' role (approach) (directive; facilitative)
B63, B64, B67, B94, B96, B97, B98, B99, B100, B107, B108, B109, B110, B111, B116, B119

7. Curricular decisions
B86, B87, B88, B89, B90, B91

8. How learning occurs (development; adaptivity)
B32, B36, B37, B38, B63, B64, B66

9. Social dimensions (interaction with others; individual)
B35, B71, B72, B95

10. What to do to learn (repetition/drill; memorization)
B8, B32, B33, B66, B85, B100, B104, B105, B106, B111

III. LEARNERS

11. "Ability" (sources of failure; sources of success; effort; self-confidence; interest)
B3, B5, B27, B29, B30, B40

IV. CONTEXT

12. Classroom context (individual; differentiated or based on ability)
B70, B71, B72

V. LEARNING TO TEACH

13. What teachers need to know (subject matter; skills of teaching; what other teachers do; students; experience; patience; curriculum; how mathematicians work)
B46, B47, B48, B49, B50, B51, B52, B53, B54, B55, B56, B57, B58, B59, B60, B61, B62

14. How teachers learn
B52, B53, B54, B55, B56, B57, B58, B59, B60, B61, B62

C. Teaching and Learning in General and Teaching as a Career

1. Diversity (social class; handicaps/gifted; students having difficulty)
C9, C14, C16, C26, C27

2. Organizing students (whole group; small group; individual)
C11, C15, C16

3. Expectations and feelings about the job
D1, D2, D4 to D13

Constructing Teacher Knowledge and Belief Indexes through Factor Analysis

In seeking for an empirical estimate of theoretically true reliability, factor analysis can be used as a tool for constructing a composite index (Carmines & Zeller, 1979; Smith, 1974). In this analysis, the teacher knowledge and belief indices are constructed on the basis of *both* the conceptual (or theoretical) structures underlying the categories of teacher knowledge and beliefs in the above conceptual framework *and* the factor (or empirical) structures underlying a set of items within the categories identified through factor analysis.

Given a category of teaching knowledge and belief--e.g., ideas about good writing, the forming of teacher knowledge and belief indices involves the following procedures.

1. We assumed that each set of items in the conceptual map defines a general area of knowledge or belief. For example, items A1, A3, A6, A7, A8, A9, A10, and A11 were judged to be the indicators of "personal attitudes and behaviors;"
2. For each set of items, we used exploratory factor analysis to identify subscales of at least three items;
3. We examined items in each subscale to decide on an appropriate label.

The composite indices and their individual items for most categories[5] of teacher knowledge and belief are summarized in a set of tables about individual item and composite reliabilities.

As a result, the development of teacher knowledge and belief indices is on the basis of the theoretical framework, with factor analysis as a tool. Through this procedure, the author attempts to create each index which is indeed unidimensional, and to avoid the likely ambiguities or artifacts created by factor analysis in the assessment of empirical measurements (see Carmines & Zeller, 1979).

The Estimate of Individual Item and Composite Reliabilities

The individual item reliabilities and the composite reliabilities for indexes can be estimated on the basis of the LISREL congeneric measurement model. This measurement model is defined by the equations,

$$X_1 = \lambda_1 \varsigma + \delta_1$$

$$X_2 = \lambda_2 \varsigma + \delta_2$$

$$\cdots\cdots$$

$$X_q = \lambda_q \varsigma + \delta_q$$

[5]Several categories were not included because they did not have any factor which has at least three items. They were "ability" (writing); what to do to learn (math); classroom context (math).

with the assumption that $\delta_1, \delta_2, \ldots, \delta_q$ are uncorrelated with ζ.

For an index with q individual items, ζ represents the theoretically true (or latent) variable of the knowledge and belief measured in this index, $X_1, X_2, \ldots, X_q$ represent the observed variables of the knowledge and belief measured in individual items, $\delta_1, \delta_2, \ldots, \delta_q$ are random measurement errors in the $X_1, X_2, \ldots, X_q$ measures, and the quantities $\lambda_1, \lambda_2, \ldots, \lambda_q$ are fixed parameters in a given population. This model implies that covariance matrix of the observed variables $X_1, X_2, \ldots, X_q$ is of the form,

$$\begin{bmatrix} \lambda_1^2+\theta_{11} & & & \\ \lambda_2\lambda_1 & \lambda_2^2+\theta_{22} & & \\ \vdots & \vdots & \ddots & \\ \lambda_q\lambda_1 & \lambda_q\lambda_1 & \cdots\cdots & \lambda_q^2+\theta_{qq} \end{bmatrix}$$

In this matrix, $\theta_{11}, \theta_{22}, \ldots, \theta_{qq}$ represent the variance of $\delta_1, \delta_2, \ldots, \delta_q$.

The reliability of individual item, i, can be computed as

$$P_{ii} \quad \frac{\lambda_i^2}{\lambda_i^2+\theta_{ii}}$$

Where λ_{ii}^2 is the theoretically true variance of X_i and $\lambda_i^2 + \Theta_{ii}$ is the observed variance of X_i. The composite reliability of measure of ρ_c can be computed as

$$P_c = \frac{\sum \lambda_i^2}{\sum (\lambda_i^2+\theta_{ii})}$$

Where $\Sigma\lambda_i^2$ is the total theoretically true variance of $X_1, X_2, \ldots, X_q$ and $\Sigma(\lambda_i^2 + \Theta_{ii})$ is the total observed variance of $X_1, X_2, \ldots, X_q$ measures.

Like Cronbach's α, ρ_c provides a measure of internal consistency for a composite

index. Unlike Cronback's α, however, instead of being based on the assumption that the composite is the unweighted sum of items, ρ_c effectively treats each item as an individual measure and the composite as a unequal item weighing. The composite as the weighted sum best estimates the factor. Consequently, ρ_c produces a closer estimate of the true reliability of the composite than α does (Smith, 1974).

The individual item reliabilities and composite reliability show how well the observed variables serve, separately or jointly, as measurement instruments for the theoretically true (latent) variable (Bagozzi, 1981; Joreskog & Sorbom/SPSS Inc., 1989).

The LISREL 7 program provides a reliability estimate for each individual item separately and a composite reliability estimate for all individual items jointly within an index. In computing the reliability of the teacher questionnaire with LISREL, because the items for knowledge and belief indices are ordinal or dichotomous scales,[6] an asymptotic covariance matrix as well as a matrix of polychoric and polyserial correlations for each index need to be created through PRELIS first. Consequently, the matrix of polychoric and polyserial correlations is analyzed by WLS method with the asymptotic covariance matrix in running LISREL (Joreskog & Sorbom/SPSS Inc., 1989).

The Sample

The sample for conducting this analysis is the TELT baseline sample. At the beginning of the TELT study, 648 teachers and prospective at eleven teacher education program sites located throughout the nation were randomly selected to complete the questionnaire. Data from these 648 participants were used for the reliability analysis.

Results

The following tables summarize the knowledge and belief indices created through factor analysis, and their individual item reliabilities and composite reliabilities. For the indices represented by Table a1, a2, a3, a4, a7, a8, a9, a10, a20, a21, a23, b1, b2, b4, b7, b13, b20, b21, and c3, although some individual item reliabilities are low, the composite reliabilities are all higher than .70. Overall, then, the measures of these indices achieve internal consistency.

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[6]Some of the multiple-choice items were recoded into dichotomous items.

A. Indices, Individual Item Reliabilities, and Composite Reliabilities in Part A: The Teaching and Learning of Writing

I. SUBJECT MATTER

a. Personal attitudes and behaviors

Table a1. Individual Item and Composite Reliabilities for Measures of attitude toward writing (enjoyment; avoidance; confidence)

Items	Individual	Composite
A1. Writing is an enjoyable activity for me.	.998	
A2. I really only write when I have to.	.389	.998
A3. I am a pretty good writer.	.307	

Table a2. Individual Item and Composite Reliabilities for Measure of behavior in writing

Items		Individual	Composite
A10.	I rarely outline my ideas before I start writing.	.678	
A11.	For most of the things I write, I only write one draft.	.130	.72
A9.	I often figure out what I want to say in the process of writing.	.085	

2. Ideas about good writing

Table a3. Individual Item and Composite Reliabilities for Measures of beliefs about good writing (mechanics & grammar; effective communication; nice or correct product form)

Items		Individual	Composite
A68.	In evaluating students' reports or papers, it is important to assign considerable weight to technical correctness.	.458	
A5.	Conventions of mechanics and grammar are critical for effective writing.	.335	.720
A99.	It is important that he review the elements of complete sentence, see appropriate examples, and practice writing complete sentences.	.279	.734
A69.	Students should not be asked to write long reports or stories until they know fundamentals of grammar, punctuation, and structure.	.280	
A66.	A piece of writing should be judged more for how well it conveys the writer's message than for how technically correctly it is written.	.231	
A111.	I would make the needed corrections and have the students copy it over.	.252	

Table a4. Individual Item and Composite Reliabilities for Measures of beliefs about good writing (mechanics & grammar; revised product; nice or correct product form; neatness; logical organization; connection with reading; audience)

Items		Individual	Composite
A37.	To be good at writing, you need to know the parts of speech and the terms people use to describe writing conventions.	.364	
A33.	To be good at writing, you need to write more than one draft.	.211	
A34.	To be good at writing, you need to be able to write in a variety of genres or forms (e.g., letters, reports, poems).	.328	
A38.	To be good at writing, you need to pay attention to the quality and appearance of the final product.	.462	.736
A30.	To be good at writing, you need to present ideas logically.	.175	
A36.	To be good at writing, you need to read widely.	.135	
A32.	To be good at writing, you need to consider the particular audience for whom you are writing.	.187	

Table a5. Individual Item and Composite Reliabilities for Measures of beliefs about good writing (audience/voice/purpose; nice or correct product form; neatness)

Items		Individual	Composite
A131.	Used a tone and mood appropriate for a friendly letter.	.494	
A129.	Thanked Ms. Wexford for something special.	.314	.685
A130.	Used the appropriate form for a letter.	.209	
A128.	Wrote carefully and neatly.	.181	

Table a6. Individual Item and Composite Reliabilities for Measures of beliefs about good writing (mechanic & grammar; neatness; nice or correct product form)

Items		Individual	Composite
A120.	Demonstrated grammatical competence.	.271	
A122.	Wrote carefully and neatly.	.354	
A121.	Spelled correctly.	.241	.604
A124.	Used the appropriate form for a letter.	.224	

3. Purpose for teaching writing

Table a7. Individual Item and Composite Reliabilities for Measures of beliefs about purposes for teaching writing (being literate; job skill; school skill)

Items		Individual	Composite
A21.	It is important that pupils learn to write so that they will be considered literate.	.553	
A22.	It is important that pupils learn to write so that they will qualify for careers which require a lot of writing.	.380	.705
A20.	It is important that pupils learn to write so that they can take notes in class.	.351	

Table a8. Individual Item and Composite Reliabilities for Measures of beliefs about purposes for teaching writing (expressing thoughts & feelings; communication; way of thinking)

Items		Individual	Composite
A18.	It is important that pupils learn to write so that they can keep track of their own thoughts and feelings.	.580	
A19.	It is important that pupils learn to write so that they can share information with others.	.522	.752
A17.	Writing helps you think better.	.357	

4. Knowledge of writing

Table a9. Individual Item and Composite Reliabilities for Measures of knowledge of writing (structure)

Items		Individual	Composite
A112.	A student asks you whether to use *is* or *are* in the following sentence. Neither of the books _____ in the library.	.288	
A113.	Some people recommend a diet of fish and chicken, but most Americans still prefer beef. Begin the sentence with although and change the transition to: 1. chicken, most; 2. chicken, while; 3. chicken, even though; 4. chicken, yet; 5. I'm not sure.	.596	.815
A114.	The new graduation requirements provoked several students into changing their majors. If you replace provoked with caused, you should replace into changing with: 1. with changing; 2. to the changing of; 3. to change; 4. I'm not sure.	.676	
A115.	Who is right? (Choose one.)	.311	

Table a10. Individual Item and Composite Reliabilities for Measures of knowledge of

writing (composition; syntax; voice/audiences)

Items		Individual	Composite
A85.	Sentences should never end with prepositions.	.582	
A84.	Sentences should never end with "and" or because."	.524	
A83.	A report or essay should always be divided into an introduction, body and conclusion.	.329	.805
A86.	Paragraphs should always begin with a topic sentence.	.330	
A87.	Whenever you introduce a new idea, you should start a new paragraph.	.278	
A88.	You should avoid using the first person ("I") when writing formal reports.	.205	

II. TEACHING AND LEARNING

5. Tasks

Table a11. Individual Item and Composite Reliabilities for Measures of knowledge or beliefs about evaluating students' competence with written language

Items		Individual	Composite
A103.	Consult with last year's teacher.	.122	
A104.	Examine students' language arts workbooks.	.461	.601
A105.	Give a standardized test of written language.	.340	

6. Teachers' role (approach)

Table a12. Individual Item and Composite Reliabilities for Measures of beliefs about teaching approaches (directive)

Items		Individual	Composite
A99.	It is important that he review the elements of a complete sentence, see appropriate examples, and practice writing complete sentences.	.274	
A70.	If students are to improve their writing, it is important for teachers to grade most students papers.	.299	.586
A81.	A major responsibility of teachers in school is to correct students' nonstandard English.	.379	

Table a13. Individual Item and Composite Reliabilities for Measures of beliefs about teaching approaches (facilitative)

Items		Individual	Composite
A110.	I would ask the student for more detail and request a rewrite.	.298	
A109.	I would help the student reorder the ideas.	.302	.478
A119.	Use her question to introduce a class discussion on what it means to write poetry.	.055	

7. How learning occurs

Table a14. Individual Item and Composite Reliabilities for Measures of beliefs about learning to write (addictiveness; development)

Items		Individual	Composite
A75.	There is a logical progression to be followed in teaching particular punctuation skills to students (e.g., students should learn to use periods before they are taught about semi-colons.	.235	.463
A40.	Students should not begin cursive writing until they have mastered printing.	.259	
A44.	Young children lack too many skills to be able to do much writing.	.170	

Table a15. Individual Item and Composite Reliabilities for Measures of beliefs about learning to write (development; additive)

Items		Individual	Composite
A45.	Students get better at writing by having opportunities to write.	.275	
A72.	Students need to learn specific strategies for composing and revising text, such as how to get ready to write and how to revise what they have written.	.290	.499
A36.	To be good at writing, you need to read widely.	.171	

8. Social dimensions

Table a16. Individual Item and Composite Reliabilities for Measures of beliefs about social dimension in writing (individual; interactions with others).

Items		Individual	Composite
A78.	It is not a good idea to have students help each other with writing assignments because the brighter students will do all the work for the others.	.338	
A73.	Students should not be asked to share their written work with others until they think it is in final form.	.264	
A46.	Students get better at writing by having opportunities to discuss their ideas with classmates and respond to one another's writing.	.346	.669
A80.	Giving each child a chance to read aloud something he/she has written is impractical in a class of 25-30 students.	.263	
A35.	To be good at writing, you need to discuss ideas with others while work is in progress and seek feedback on drafts.	.209	

III. LEARNERS

II. Diversity

Table a17. Individual Item and Composite Reliabilities for Measures of beliefs about diversity in learning to write (age; gender; native ability)

Items		Individual	Composite
A44.	Young children lack too many skills to be able to do much writing.	.363	
A39.	In general, girls tend to be naturally better than boys at writing.	.192	.529
A77.	The writing curriculum in the early elementary grades should emphasize handwriting.	.126	
A41.	There are some students who can simply never be good at writing.	.145	

Table a18. Individual Item and Composite Reliabilities for Measures of beliefs about diversity in learning to write (age; native ability; handicaps/gifted)

Items		Individual	Composite
A44.	Young children lack too many skills to be able to do much writing.	.247	
A41.	There are some students who can simply never be good at writing.	.238	.498
A39.	In general, girls tend to be naturally better than boys at writing.	.173	
A79.	Planning writing instruction for gifted writers is easier than for students with language-related learning disabilities.	.124	

IV. LEARNING TO TEACH

12. What teachers need to know

Table a19. Individual Item and Composite Reliabilities for Measures of beliefs about what teachers need to know in order to teach writing (skills of teaching; subject matter; students)

Items		Individual	Composite
A63.	Take a course on teaching writing.	.407	
A62.	Take a course on writing.	.472	.673
A64.	Study samples of student writing and see how others have evaluated student writing.	.236	
A57.	Read a variety of kinds of writing.	.149	

Table a20. Individual Item and Composite Reliabilities for Measures of beliefs about what teachers need to know in order to teach writing (subject matter)

Items		Individual	Composite
A53.	To teach writing effectively, teachers need to know parts of speech and terms people use to describe writing conventions.	.791	
A54.	To teach writing effectively, teachers need to know terms people use to describe the writing process.	.544	.841
A56.	Review grammar.	.233	

Table a21. Individual Item and Composite Reliabilities for Measures of beliefs about what teachers need to know in order to teach writing (what other teachers do; how writers work)

Items		Individual	Composite
A60.	Observe or talk to other teachers of writing.	.601	
A59.	Be observed by other teachers of writing and get their comments.	.549	.748
A61.	Interview writers about how they write.	.195	

Table a22. Individual Item and Composite Reliabilities for Measures of beliefs about what teachers need to know in order to teach writing (subject matter)

Items		Individual	Composite
A51.	Teachers must write a lot in order to teach writing effectively.	.172	
A52.	Being a good writer oneself has very little to do with being a good teacher of writing.	.064	.574
A55.	Do more writing myself.	.292	
A57.	Read a variety of kinds of writing.	.217	

13. How teachers learn

Table a23. Individual Item and Composite Reliabilities for Measures of beliefs about how teachers learn to teach writing

Items		Individual	Composite
A63.	Take a course on teaching writing.	.459	
A65.	Get some (or more) experience teaching writing.	.554	
A58.	Improve general teaching skills--like how to motivate students.	.154	.718
A64.	Study samples of student writing and see how others have evaluated student writing.	.213	

Table a24. Individual Item and Composite Reliabilities for Measures of beliefs about how teachers learn to teach writing

Items		Individual	Composite
A55.	Do more writing myself.	.351	
A62.	Take a course on writing.	.318	
A57.	Read a variety of kinds of writing.	.233	.597
A56.	Review grammar.	.144	

B. Indices, Individual Item Reliabilities, Composite Reliabilities in Part B: The Teaching and Learning of Mathematics

I. SUBJECT MATTER

1. Personal attitudes

Table b1. Individual Item and Composite Reliabilities for Measures of attitude toward mathematics (enjoyment; confidence; avoidance)

Items	Individual	Composite
B1. Math just is not my strength and I avoid it whenever possible.	.809	
B2. I'm pretty good at math and I enjoy the challenge of it.	.744	
B3. I can handle basic math, but I do not have the kind of mind needed to do advanced mathematics.	.480	.894
B5. If I would give it full effort, I know I could learn advanced math.	.245	

2. Ideas about mathematics

Table b2. Individual Item and Composite Reliabilities for Measures of beliefs about mathematics (linear/step-by-step; body of knowledge; rules/procedures)

Items		Individual	Composite
B24.	To be good in mathematics, you need to think in a logical step-by-step manner.	.455	
B23.	To be good at mathematics, you need to remember formulas, principles, and procedures.	.528	
B25.	To be good at mathematics, you need to have basic understandings of concepts and strategies.	.339	.758
B69.	To do well, students must learn facts, principles, and formulas in mathematics.	.287	
B7.	Doing math is usually a matter of working logically in a step-by-step fashion.	.117	
B38.	It is important for pupils to master the basic computational skills before studying topics like probability and logic.	.128	

Table b3. Individual Item and Composite Reliabilities for Measures of beliefs about mathematics (way of thinking; arbitrary/abstract; creative)

Items		Individual	Composite
B9.	High school algebra is totally unlike anything presented to students in the lower grades.	.204	
B8.	A lot of things in math must simply be accepted as true and remembered; there aren't explanations for them.	.360	
B6.	Doing math allows room for original thinking and creativity.	.297	.633
B26.	To be good at mathematics, you need to be able to think flexibly.	.236	
B35.	If students get into arguments about ideas or procedures in math class, it can impede their learning of math.	.148	

3. Knowledge of mathematics

Table b4. Individual Item and Composite Reliabilities for Measures of knowledge of mathematics (negative number; division)

Items		Individual	Composite
B80.	You can not subtract a larger number from a smaller one.	.750	
B84.	To divide fraction, invert and multiply.	.368	.817
B79.	When you are setting up a division problem, the greater number always goes inside the bracket.	.470	

Table b5. Individual Item and Composite Reliabilities for Measures of Knowledge of mathematics (multiplication; slope; power)

Items		Individual	Composite
B104.	When you multiply two negatives together, you always get a positive.	.464	
B105.	The slope of a vertical line is undefined.	.251	.626
B106.	Any nonzero number to the zero power is 1. ($x0=1$)	.321	

Table b6. Individual Item and Composite Reliabilities for Measures of knowledge of mathematics (proportion/ratio; slope; place value; division)

Items		Individual	Composite
B77.	Which of the students has represented the relationship best? (Choose one.)	.235	
B103.	If you asked your students to write what "slope" is, which of the following responses would you accept? (Choose one.)	.156	.548
B92.	What do you think about this?	.317	
B78.	Which of the following is a good story problem to illustrate what 1 1/4 divided by 1/2 means?	.206	

4. Purposes for teaching mathematics

Table b7. Individual Item and Composite Reliabilities for Measures of beliefs about the purposes for teaching mathematics (think better; school skill; tool in life; be educated)

Items		Individual	Composite
B10.	Math helps you learn to think better.	.387	
B12.	To succeed in school, you need to be good in math.heir comments.	.253	
B11.	Math is needed for many jobs and careers.	.412	.700
B13.	To be well-educated person, it is just as important to study major areas of math as it is to read classic literary work.	.393	

II. TEACHING AND LEARNING

5. Tasks (activities)

Table b8. Individual Item and Composite Reliabilities for Measures of teachers' inclination (responding to students)

Items		Individual	Composite
B98.	I would remind the child that rectangles have two sides longer and two sides shorter, while squares have sides of equal length.	.193	
B94.	I would tell here that I would like her to concentrate on learning the standard way of doing it.	.449	.657
B95.	I would discourage her from using it because it would confuse the rest of the class.	.408	
B111.	I would tell them they simply have to remember that these are different.	.146	

6. Teachers' role (approach)

Table b9. Individual Item and Composite Reliabilities for Measures of beliefs about teaching approaches (directive; facilitative)

Items		Individual	Composite
B108.	I would draw a picture of each one and compare them.	.294	
B97.	I would ask her to explain how she figured this out and why she think it works.	.108	.507
B110.	I would create story problems illustrating each expression.	.282	

Table b10. Individual Item and Composite Reliabilities for Measures of beliefs about teaching approaches (facilitative)

Items		Individual	Composite
B99.	I would ask the child why he or she is calling it a rectangle.	.264	
B97.	I would ask her to explain how she figured this out and why she think it works.	.434	.548
B64.	Teachers should not necessarily answer students' questions but should let them puzzle things out themselves.	.078	

Table b11. Individual Item and Composite Reliabilities for Measures of beliefs about teaching approaches (directive)

Items		Individual	Composite
B67.	If a student is confused in math, the teacher should go over the material again more slowly.	.588	
B107.	I would show them by replacing the variables with numbers and then show that two results are different.	.073	.619
B63.	Students should never leave math class (or end of the math period) feeling confused or stuck.	.109	

7. Curricular decisions

Table b12. Individual Item and Composite Reliabilities for Measures of curricular decisions

Items		Individual	Composite
B88.	I would save it and see if I had time for this chapter at the end of the year.	.477	
B87.	I would not bother with this chapter.	.348	.630
B86.	I would begin the year with this chapter.	.129	
B89.	I would plan to weave this content in across the year.	.100	

8. How learning occurs

Table b13. Individual Item and Composite Reliabilities for Measures of beliefs about mathematics learning (additive; development)

Items		Individual	Composite
B36.	In learning math, students must master topics and skills at one level before going on.	.564	
B38.	It is important for pupils to master the basic computational skills before studying topics like probability and logic.	.371	.746
B66.	If students are having difficulty in math, a good approach is to give them more practice in the skills they lack.	.250	
B32.	For students to get better at math they need to practice a lot.	.215	
B37.	A teacher should wait until pupils are developmentally ready before introducing new ideas and skills.	.310	

9. Social dimensions

Table b14. Individual Item and Composite Reliabilities for Measures of beliefs about social dimensions in mathematics teaching (interaction with others; individual)

Items		Individual	Composite
B35.	If students get in to arguments about ideas or procedures in math class, it can impede their learning of math.	.281	
B95.	I would discourage her from using it because it would confuse the rest of the class.	.143	.480
B71.	It is not a good idea to have students work together in solving math problems because the brighter students will do all the work.	.269	

III. LEARNERS

11. "Abilities"

Table b15. Individual Item and Composite Reliabilities for Measures of beliefs about sources of success for a mathematics learner (effort; self-confidence; interest)

Items		Individual	Composite
B29.	To be good at mathematics, you need to work hard at it.	.247	
B27.	To be good at mathematics, you need to have confidence you can do it.	.324	.498
B30.	To be good at mathematics, you need to be interested in mathematics.	.115	

Table b16. Individual Item and Composite Reliabilities for Measures of beliefs about sources for success for a mathematics learner (native ability)

Items		Individual	Composite
B28.	To be good at mathematics, you need to have a kind of "mathematical mind".	.552	
B40.	Math is a subject in which natural ability matters a lot more than effort.	.287	.639
B3.	I can handle basic math, but I do not have the kind of mind needed to do advanced mathematics.	.118	

IV. LEARNING TO TEACHING

13. What teachers need to know

Table b17. Individual Item and Composite Reliabilities for Measures of beliefs about what teachers need to know in order to teach mathematics (what other teachers do; curriculum; experience; skills of teaching)

Items		Individual	Composite
B60.	Look at examples of student work in math.	.455	
B61.	Learn more about the school's math curriculum.	.423	.672
B62.	Get (some or more) experience teaching math.	.236	
B58.	Improve general teaching skills--such as how to motivate students.	.148	

Table b18. Individual Item and Composite Reliabilities for Measures of beliefs about what teachers need to know in order to teach mathematics (subject matter)

Items		Individual	Composite
B49.	In order to teach problem solving, teachers have to do a lot of math problem solving themselves.	.404	
B50.	It is important for teachers to know mathematical terminology.	.366	
B48.	Understanding math as a discipline is important for teaching math at any level.	.233	.632
B46.	If a student asks a question in math, the teacher should know the answer.	.134	

Table b19. Individual Item and Composite Reliabilities for Measures of beliefs about what teachers need to know in order to teach mathematics

Items		Individual	Composite
B52.	Review basic skills, such as factoring or operations with fractions.	.086	
B51.	Basic computational skill and a lot of patience are sufficient for teaching elementary school math.	.410	.452
B47.	Being good at mathematical problem solving personally has little to do with being a good math teacher.	.034	

14. How teachers learn

Table b20. Individual Item and Composite Reliabilities for Measures of beliefs about how teaches learn to teach mathematics

Items		Individual	Composite
B54.	Be observed by other math teachers and get their comments.	.593	
B60.	Look at examples of student work in math.	.301	
B61.	Learn more about the school's math curriculum.	.327	
B59.	Take a course on teaching math.	.282	
B53.	Observe other math teachers and get their comments.	.534	
B55.	Take a math course.	.386	
B62.	Get (some or more) experience teaching math.	.168	
B58.	Improve general teaching skills--such as how to motivate students.	.116	.843
B52.	Review basic skills, such as factoring or operations with fractions.	.121	
B56.	Find out more about how mathematicians work.	.157	
B57.	Read about great mathematicians and the history of mathematics.	.006	

Table b21. Individual Item and Composite Reliabilities for Measures of beliefs about how teachers learn to teach mathematics

Items		Individual	Composite
B52.	Review basic skills, such as factoring or operations with fractions.	.006	
B53.	Observe other math teachers and get their comments.	.483	.940
B55.	Take a math course.	.065	
B54.	Be observed by other teachers and talk with them.	.936	

C. Teaching and Learning in General and Teaching as a Career

1. Diversity

Table c1. Individual Item and Composite Reliabilities for Measures of beliefs about diversity (social class; handicaps/gifted)

Items		Individual	Composite
C16.	When working with students form low-income families, teachers should rely primarily on teacher-directed, focused, whole-group instruction.	.455	
C14.	When working with slow learners, teachers should focus nearly all their instruction on "minimum competency" objectives.	.276	.565
C9.	Handicapped children who are placed in regular classes should not be expected to keep up with the rest of the class.	.079	

2. Organizing students

Table c2. Individual Item and Composite Reliabilities for Measures of beliefs about organizing students (whole group; small group; individual)

Items		Individual	Composite
C16.	When working with students form low-income families, teachers should rely primarily on teacher-directed, focused, whole-group instruction.	.327	
C11.	It is impractical for teachers to tailor instructions to the unique interests and abilities of different students.	.200	.577
C15.	When students work in groups, the teachers can not really evaluate student's work.	.386	

3. Expectations and feelings about the job

Table c3. Individual Item and Composite Reliabilities for Measures of beliefs about expectations and feelings about the job

Items		Individual	Composite
D7.	I have been thinking about leaving teaching in the near future.	.559	
D8.	If I could get another job I would leave teaching.	.779	.852
D6.	I am sure teaching will be my life-long career.	.254	
D5.	I am not as happy about teaching as I thought I would be.	.385	

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